

# **International Journal of Occupational Safety and Ergonomics – rok 2011, ročník 17**

## **Číslo 1**



### **PROTECTION OF HUMAN IN THE WORKING ENVIRONMENT**

**Cesar F. Nascimento, Paulo Fernando F. Frutuoso e Melo. *A Behavior- and Observation-Based Monitoring Process for Safety Management*. S. 407–420.**

The objective of this paper is to demonstrate that a combination of a behavior-based monitoring process—using an at-risk behavior and unsafe condition observation system—and an observation-based safety adherence monitoring process that can indicate the compliance level with well-defined and agreed safety critical aspects and operational practices and procedures will be an effective safety management tool. This tool herein described represents a particular case, developed by a Praxair Inc. subsidiary in Brazil. Other safety surveillance systems usually adopted in industrial environments can rarely be used on construction sites. They also do not share information, knowledge and skills among the safety staff and other professionals invited to observe, usually covering specific tasks or specific professionals only, not a complete working area, which causes functional observing and monitoring limitations in terms of capturing behaviors and environmental safety issues. This tool also offers a wide range of learning opportunities and continuous improvement.

**Graham K. Shelton-Rayner, Rubina Mian, Simon Chandler, Duncan Robertson, David W. Macdonald. *Quantifying Transient Psychological Stress Using a Novel Technique : changes to PMA-Induced Leukocyte Production of ROS In Vitro*. S. 3–13.**

Although much work has been conducted to quantify the long-term physiological effects of psychological stress, measures of short-term, low-level stress have been more elusive. This study assessed the effect of exposure of volunteers to a mild, brief, psychologically stressful event, on the functional ability of leukocytes in whole blood to respond to phorbol 12-myristate 13-acetate (PMA) in vitro. Volunteers operated a car electric window and adjusted it to 4 pre-determined positions. Between each operation the mechanism's polarity was covertly altered (group B) or remained unaltered (group A). For each treatment group 10 different subjects provided capillary blood samples pre- and post-stressor. Using a chemiluminescent technique termed leukocyte coping capacity, the ability of leukocytes to produce reactive oxygen species (ROS) in vitro was assessed.

ROS release differed significantly at 10 min post-stressor between treatment groups, suggesting exposure to acute psychological stress leads to a reduced ability to respond to bacterial challenge.

**Conor Vaughan MacDonald, Christopher James Brooks, John William Kozey, Anthony Habib. *The Influence of Familiarity on Life Jacket Donning Performance: Implications for Participant Selection*. S. 15–23.**

Laboratories and test houses keep a “pool” of test subjects that volunteer to be participants in life jacket approval testing, which is believed to be an incorrect procedure. Fifty-six participants donned 8 child/infant life jackets onto 4 infant manikins in random order with time and accuracy of donning recorded. Average donning time for all 8 life jackets decreased significantly after the first donning experience. The findings show that the effect of familiarity occurs immediately after the first test, regardless of life jacket type, thus “contaminating” the subject and making them unsuitable for further tests. These observations are important for life jacket standards where the life jacket must be donned by a naïve participant. Currently, a poorly designed life jacket may receive a pass as a result of the learning effect as shown by participants with previous donning experiences.

**Joanna Bugajska, Anna Jędryka-Góral, Maria Widerszal-Bazyl, Ewa Orłowska-Baranowska, Adam Sagan, Janina Małgorzata Michalak, Krystyna Zużewicz, Maria Konarska. *Job Strain, Overtime, Life Style, and Cardiovascular Risk in Managers and Physical Workers*. S. 25-32.**

The purpose of the study was to determine the relation between overtime, job strain and life style, and cardiovascular risk (CVR) in 97 managers and 98 physical workers. CVR was measured with the Framingham method. Information about job strain, overtime, life style and extra-occupational activities was obtained with a self-administered questionnaire. The results showed that both groups had a similar, medium-level job stress. Being a manager and having extra-occupational activities (self-education) were significantly related with CVR ( $p = .000$ ,  $p = .035$ , respectively), whereas other factors that were analysed (i.e., physical work and overtime) were not. The managers were older than the physical workers; that may be why the factor of being a manager was significantly related to CVR. The extra-occupational activities connected with improving workers' skills may play an important role in the development of workers' overload and an increase in CVR.

**Český abstrakt:** Cílem studie bylo zjistit vztah mezi prací přesčas, pracovní zátěží a životním stylem a kardiovaskulárními riziky (CVR) u 97 manažerů a 98 fyzických pracujících. CVR byla měřena Framinghamovou metodou. Informace o pracovním napětí, práci přesčas, životním stylu a extra pracovních činnostech byly získány pomocí samostatně vyplňovaných dotazníků. Výsledky ukázaly, že obě skupiny jsou vystaveny podobnému pracovnímu stresu na střední úrovni. Být manažerem a vykonávat extra pracovní činnosti (např. sebevzdělávání) významně souvisí s CVR, zatímco jiné analyzované faktory (tj. fyzická práce přesčas) s CVR významně nesouvisely. Manažeři byli starší než fyzicky pracující, což mohlo být důvodem, proč být manažerem významně souvisí s CVR. Extra pracovní činnosti spojené se zlepšováním dovedností zaměstnanců může hrát důležitou roli u přetěžování pracovníků a zvýšení kardiovaskulárních rizik.

- **Klíčová slova:** rizika kardiovaskulární, stres pracovní, zátěž pracovní, práce přesčas, styl životní, manažeři, dělníci, studie, srovnání

**Pranas Baltrėnas, Raimondas Buckus. *Research and Assessment of Safety Distance of TV Electromagnetic Fields*. S. 33-39.**

The evaluation covers the strengths of electric field and magnetic flux density measured in frequency ranges of 5 Hz–2 kHz and 2–400 kHz of selected TV sets. The dependence of the electromagnetic field on the distance is addressed with reference to ergonomics and safety. Ten TV sets (5 tube and 5 LCD) were measured. There were 16 measurements for each one. The aim was to evaluate electric field and magnetic flux density versus the distance from the tested device with regard to exposure levels. In addition, the distance and the strengths of electric field and magnetic flux density emitted by tube and LCD TVs were compared. The results are presented in charts.

**Sylwia Krzemińska, Władysław M. Rzymiski. *Barrierity of Hydrogenated Butadiene-Acrylonitrile Rubber and Butyl Rubber After Exposure to Organic Solvents*. S. 41-47.**

Resistance of antichemical clothing primarily depends on the type of material it is made from, in particular on the type of polymer used for coating the fabric carrier. This paper reports on systematic investigations on the influence of the cross-linking density of an elastomer and the composition of a cross-linked elastomer on its resistance to permeation of selected organic solvents. Tests of barrier material samples made from nonpolar butyl rubber (IIR) and polar hydrogenated butadiene-acrylonitrile rubber (HNBR) showed that (a) in rubber-solvent systems with medium thermodynamic affinity, cross-linking density influenced resistance to permeation and (b) the polarity of the system had a significant influence on barrierity.

**Český abstrakt:** Odolnost protichemických oděvů primárně závisí na druhu materiálu, z kterého jsou vyrobeny, a to zejména na typu polymeru aplikovaného na tkaninu. Tento dokument referuje o systematických výzkumech vlivu síťové hustoty elastomeru a složení síťového elastomeru na jeho odolnost vůči pronikání vybraných organických rozpouštědel.

- **Klíčová slova:** rozpouštědla, odolnost, pronikání, elastomery, oděvy ochranné, expozice pracovníků

## **PROTECTION OF HUMAN AT THE WORKSTATION**

**John M. McGrath. *The Role of Equipment Warning Labels in the Industrial Workplace*. S. 49-60.**

Among the many ways in which workers can get safety information, the role of equipment warning labels has not been well articulated. Presumably, warning labels help prevent accidents, but questions remain about how well those labels can be expected to work. This essay describes how contextual analysis can assist our understanding of warning label effectiveness. A contextual approach was conceptualized in terms of underlying communication variables and an exploratory study was conducted in which workers were asked if they noticed and remembered warning labels on an industrial table saw that they used over a 3-month period. Results showed that equipment warning labels had a limited impact on workers. The contextual approach explained the relative effectiveness of multiple sources of information. Implications for safety training and accident liability are discussed.

**Colin D. McKinnon, Jack P. Callaghan, Clark R. Dickerson. *Field Quantification of Physical Exposures of Police Officers in Vehicle Operation*. S. 61-68.**

Mobile police officers perform many of their daily duties in their vehicles. Combined workspace inflexibility and prolonged driving create potential musculoskeletal injury risks. Limited research exists that quantitatively describes postural and load exposures

associated with mobile police work. The purpose of this study was to characterize officer activity during a typical workday and identify opportunities for ergonomic intervention. Digital video of traffic officers (N = 10) was used to classify postures according to work activity. Cumulative time in 10 activities was calculated, and a time-history of driver activity documented. Most ( $55.5 \pm 13.4\%$ ) time was out of the vehicle, and  $22.3 \pm 10.5\%$  was spent in single-arm driving. Onpaper documentation and mobile data terminal use were identified as in-car activities that may benefit from targeted interventions. The primary contribution of this study is characterization of daily mobile police activity and the identification of possible intervention strategies to mitigate physical exposure levels.

**Felicja Lwow, Paweł Józków, Marek Mędraś. *Occupational Exposure to Impulse Noise Associated With Shooting.* S. 69-77.**

Shooting training is associated with exposure to a considerable amount of unique noise. We wanted to evaluate noise exposure during such training. Our observations especially apply to professional sport shooters, but they are also valid for shooting coaches/instructors. We collected acoustic signals in 10-, 25- and 50-m as well as open-air shooting ranges. The recorded material was analysed with orthogonal, adaptive parameterization by Shur. The mean duration of a single acoustic signal was 250–800 ms with the C-weighted sound peak pressure level of 138.2–165.2 dB. Shooters may be exposed to as many as 600–1350 acoustic impulses during a training unit. The actual load for the hearing organ of a professional shooter or a shooting coach is ~200 000 acoustic stimuli in a year-long training macrocycle. Orthogonal, adaptive parameterization by Shur makes safe scheduling of shooters' training possible.

**Luiz Felipe Silva, Rogério Cabral. *Noise Exposure Levels of Priests and Worshippers in Protestant Churches.* S. 79-86.**

**Context.** Worship in Protestant churches in Brazil is very noisy. Thus, this practice may pose a hearing risk. **Aims.** To evaluate the priests' and worshippers' noise exposure during worship. Settings and design. The analysis was carried out in 5 churches located in the city of São José dos Campos, Brazil. **Methods and material.** To estimate the worshippers' noise exposure, an author of this study was also submitted to dosimetry. The methodology was based on Fundacentro's Occupational Hygiene Standard No. NHO-01 (2001). Weekly noise exposure was estimated according to the priest's information about the number of services in the period. **Results.** The priest's noise exposure was over the recommended limits. The normalized exposure level varied between 95.4 to 99.5 dB(A). In 2 of the churches, the noise exposure registered, with values of 85.3 and 86.5 dB(A), may also pose risk to the worshippers. **Conclusions.** Worship in the churches generated sound pressure levels that imply health risk, especially to priests, so hearing conservation programs with adequate acoustical sanitation measures must be implemented there.

**Troy Jones, Shrawan Kumar. *Biomechanical Loads and Subjective Stress Exposure to Lumber Graders in Sawmill Industry.* S. 87-97.**

The aim of this study was to determine biomechanical loads and subjective stresses on lumber graders and associated morbidity in a high risk and repetitive sawmill occupation. The exposures of all 29 male sawmill worker volunteers were recorded. Motion and posture were studied with electrogoniometers, muscle loads were recorded with surface electromyography, and psychophysical stresses were assessed with subjective responses. Fifty-nine percent of the participants reported greater than moderate discomfort in their taskdominant upper extremity. Job performance required an average range of motion of  $44^\circ$ ,  $21^\circ$ , and  $52^\circ$  in flexion/extension, radial/ulnar deviations, and pronation/supination respectively. It also required an average of 9% maximum voluntary contraction force and was repeated an average of 34 times/min. This repetitive exertion over an 8-h shift was

deemed to be a significant risk factor associated with prevalent upper extremity morbidity.

**Český abstrakt:** Cílem této studie bylo zjistit biomechanickou zátěž a subjektivní stres u třídičů dříví a přidruženou nemocnost u vysoce rizikových a opakující se pilařských povolání. V průběhu výzkumu byla zaznamenána expozice všech 29 mužských dobrovolníků pracujících na pile. Pohyb a držení těla byly studovány elektrogoniometry, svalová zátěž byla zaznamenávána pomocí povrchové elektromyografie a psychofyzická zátěž byla hodnocena prostřednictvím subjektivních odpovědí. 59 % účastníků hlásilo větší než mírné nepohodlí při dominantních činnostech horních končetin. Tato opakující se námaha v průběhu 8-hodinové směny byla považována za významný rizikový faktor spojený s převládající nemocností horní končetin.

- **Klíčová slova:** zátěž pracovní, zátěž fyzická, zátěž biomechanická, zátěž psychofyzická, expozice pracovníků, dřevařské průmysl, pily, horní končetiny

**Ismaila Adamu Saidu, Victor Adimabua Utti, Adeolu Olugbenga Jaiyesimi, Adamu Ahmad Rufa'i, Stanley Monday Maduagwu, Henry Adezie Onuwe, Abdurahman Mohammed Jajere. *Prevalence of Musculoskeletal Injuries Among Factory Workers in Kano Metropolis, Nigeria. S. 99-102.***

**Background.** Kano is a metropolis and commercial centre in northern Nigeria; it is highly industrialized. Most of the population does factory work. **Purpose.** The survey was undertaken to identify the prevalence of musculoskeletal injuries (MSIs) and other related occupational hazards among factory workers in Kano Metropolis. **Method.** Five hundred questionnaires were distributed to respondents recruited from tannery, steel rolling, textile and agrochemical factories at the 3 industrial estates of the metropolis. Only unskilled and manual labourers were considered. The respondents were selected using the nonprobability sample of convenience. **Results.** Only 420 questionnaires were returned duly completed. Three hundred and fifty-three (84.05%) respondents were male and 67 (15.95%) were female. Their ages ranged between 21 and 58 years ( $M = 38.99 \pm 1.01$ ). **Results.** Low back complaints had the highest prevalence (360, 85.71%), followed by upper limb injuries (171, 40.71%), shoulder complaints (156, 37.14%) and hip injuries (34, 8.10%). About 41% of the respondents reported 2 or more work-related MSIs. **Conclusion.** The study uncovered that a substantial percentage of factory workers had sustained MSIs. Body ache/discomfort in the low back region was the most common injury sustained among the subjects surveyed.